AGRICULTURE RECONSTRUCTION AND DEVELOPMENT PROGRAM FOR IRAQ

BAGHDAD POULTRY FARM SURVEY
Summary Report

April 2006

This publication was produced for review by the United States Agency for International Development. It was prepared by Development Alternatives, Inc.

Contract No. RAN-C-00-04-00002-00

BAGHDAD POULTRY FARM SURVEY
Summary Report

Baghdad Poultry Farm Survey

Summary Report

Ministry of Agriculture, Baghdad
and
Agriculture Reconstruction and Development Program for Iraq

April 2006

Executive Summary

A healthy poultry sector is vital to a prosperous Iraqi economy and the health of its citizens. The poultry industry provides a source of income and employment for many Iraqis. Poultry meat is relatively inexpensive and (along with eggs) has become the main source of animal protein in the Iraqi diet. In the summer of 2005, ARDI and the Ministry of Agriculture (MoA) collaborated on a comprehensive survey of poultry production in Baghdad Governorate in order to better understand the challenges and opportunities of the poultry sector in this important region of the country.

The main findings of the survey reveal that on average, poultry farms in Baghdad are not covering their variable costs of production. Poultry operations are producing birds that are 26% lighter than farms in the northern Iraq in the same amount of time. Possible explanations for this disparity include poor nutrition, poor management, and inferior flock genetics. However, the economic health of industry could be turned around. If average sale weight increased by only 100 grams, margins over variable costs would increase approximately 269 dinars for every kilogram of bird sold. This would move producers from margins of -44 dinars per kilogram of bird sold to positive margins of 225 dinars per kilogram of bird sold. For the poultry industry to realize its potential, ARDI recommends further studies investigating the nutritional content of feed mixes currently utilized, and the genetic makeup of poultry flocks in Baghdad governorate.

Table of Contents

1 Introduction

Poultry meat and eggs have become the main source of animal protein in the Iraqi diet, and in the past few years poultry production has become one of the most dynamic agricultural subsectors in Iraq. Because of its contribution to the Iraqi economy, it is important to identify the problems and constraints of the poultry sector. The recent discovery and subsequent spread of Highly Pathogenic Avian Influenza (HPAI) in Iraq makes a thorough understanding of the poultry industry even more important.

The Ministry of Agriculture (MoA) and Agriculture Reconstruction and Development Program for Iraq (ARDI) collaborated on a poultry sector survey in order to provide policy makers and the private business community with accurate information related to poultry industry in Baghdad. Baghdad governorate accounts for approximately 21% of the population in Iraq[1] and collectively is the largest market for poultry in the country. Information related to the poultry industry in Baghdad has implications not only for Baghdad itself, but for the country as a whole. Additional understanding of the national poultry industry can be gained when the results from this survey are compared with those from the ARDI/MoA 2004 poultry survey of Erbil, Dahuk, and Sulaymaniyah governorates.

The survey was designed to examine various components of poultry production. Enumerators visited individual operations in order to determine location, when the business was established, size and capacity utilization. Enumerators also asked questions related to production inputs, feed composition, vaccinations, starter chicks, equipment, and related costs.

In order to operate a commercial poultry farm, farmers are required to obtain a license from the MoA, and each registered farm is assigned to a veterinarian who is responsible for periodic on-site inspections. Farms are required to post in a visible place on the premises a large sign with the particulars of the license, including authorized capacity, date of issue, and validity. The database of poultry farms is kept and maintained by the Department of Veterinary and Animal Resources. Once a farm shuts down it is required to notify the Department of Veterinary and Animal Resources so that the database can be updated.

From the list 1,500 registered poultry farms in Baghdad governorate, a random sample of 221 farms was drawn. Unfortunately, complete information was recorded from only 102 poultry farms resulting in a response rate of 46%. This number fell well short of the goal of 221 farms. The main reason that information was not collected at many poultry operations was that many of the farms appeared to be not in operation. Based on the number of farms that were apparently not operational during the survey, the database should be used with caution about its accuracy. The 46% response rate recorded during the survey could indicate that over half of the registered farms are no longer in business. This by itself is an important finding of the survey.

[1] Based on 2003 Iraq Ministry of Health estimates

2 Background of the Poultry Industry in Iraq and Baghdad

In 2003 the poultry subsector suffered from the disruptions caused by the removal of subsidies in feeds, veterinary supplies, and equipment; and breakdowns in the supply of electricity and fuel. As a result many poultry farms closed, at least temporarily. Egg production recovered rapidly in response to increased domestic demand; recovery in production of broilers has been slower in the face of competition from imported frozen chicken meat. However, the subsector has also benefited to some degree from an open market where demand for its products increased rapidly due to increased household income.

Since 2003, there has also been a significant turnover of responsibility of the operation of poultry farms. Some original owners have rented their farms to new operators or put their farms in the care of managers with little experience in poultry production. An effective private sector network for the provision of veterinary services, vaccines, and medicines has not yet emerged to replace or complement the government veterinary system, whose services and supplies have suffered from reduced funding.

3 Methodology

Three distinct types of poultry exist in the governorate: Commercial poultry (broiler) farms; traditional household poultry breeding; and factory farms in egg production. Egg producing operations were not included in this survey because an analysis of the industry would require a separate set of questions. The survey also did not attempt to collect information on the performance of household backyard poultry breeding, even though it constitutes a traditional economic activity among rural families, mostly for household consumption but also as an income generating activity. It should be noted that any further discussion of “poultry”, refers to broiler production.

3.1 Questionnaire Design

The questionnaire adopted for the Baghdad poultry farm survey is a slightly modified version of a questionnaire originally developed for a similar survey in Erbil, Dahuk, and Sulaymaniyah. Changes in the survey were kept to a minimum in order to ensure that the results would be fully comparable.

In order to evaluate the productivity and economic performance of poultry farms, the survey asked farmers to recall details about the last batch (or flock) of birds that they had sold. The details recorded included number of chicks purchased, weight at the

end of each growth stage, and sale age and price of birds. Estimates of the quantity of each feed ration consumed by the last batch were also recorded. Revenue from the sale of the last batch could then be estimated from the data on the number of birds sold, average weight, and average price per kilogram live weight.

During the survey, enumerators focused on obtaining good data on the composition of poultry rations used by farmers in the region. Farmers can have as many as three different rations for distinct stages in the growth curve of poultry due to changing nutritional requirements. The price of each ingredient and the origin (whether it was purchased in the market or produced at the farm) was recorded.

The questionnaire also included questions regarding the cost of day-old-chicks, the cost of vaccines and veterinary medicines, labor wages and other direct costs incurred for the last batch of birds sold. The questionnaire requested information on which months the farm was not in operation, in both winter and summer.

3.2 Personnel

Five teams of enumerators were selected and assigned by the MoA to carry out the survey farm interviews. Each team was comprised of two staff members, one from the Department of Veterinary and Animal Services and the other from the Planning Directorate (Statistics Unit). Two monitors from the MoA coordinated all field team activities.

Team members came mainly from district offices of the agricultural department. Each team was scheduled to interview two farms per day in or nearby their respective districts. Hired vehicles were assigned to take each field team to the target sample farms

Questionnaires were entered into an Access database designed by staff of the Statistics Unit of the MoA. Each questionnaire was carefully reviewed by the supervisor before entering data in the database. A thorough interactive process of debugging and cleaning was necessary to ensure that only clean data were included in the analysis. When it was not possible to resolve questionable data, those observations were not taken into account in the analysis.

3.2 Activities Summary

- Obtained the registry of the poultry operations from the MoA offices in Baghdad. The information in the registry included the location and approximate size of operations.

- Selected a sample of poultry farmers to interview.

- Developed appropriate questionnaires to capture the necessary information from each enterprise including production, technology, inputs, costs, and revenues.

- Trained a team of enumerators to interview managers of poultry operations.

- Drafted a calendar of interviews and assigned each enumerator a list of poultry farms to visit. Transport to the farms was arranged using hired vehicles.

- Data collection proceeded for a period of 4 to 5 weeks starting on May 1st, 2005.

- Private sector data entry services consultants were hired to enter questionnaire data into a database suitable for analysis. The Statistics Unit was provided periodically with electronic copies of data as they were entered.

- A team of two principal researchers comprised of an agricultural economist and a statistician were primarily responsible for processing and analyzing the data.

- Report writing was the responsibility of the principal researchers

4 Survey Results

4.1 Location of farms

In 2004 there were approximately 1,500 poultry farms licensed by the Department of Veterinary and Animal Resources of the MoA in Baghdad Governorate. A listing of the number of poultry farms in each district can be seen in Table 1. Poultry farms are generally located away from population centers and central markets. The average distance to a central market was reported to be 38 kilometers.

Table 1: Location of Registered Poultry Farms in Baghdad Governorate

District	Registered Farms	Percent
Abu Ghreb	247	16.5%
Al Rashidiah	100	6.7%
Al Rashid	84	5.6%
Al Tarmaih	190	12.7%
Al Kadhmiah	200	13.3%
Al Latifah	58	3.9%
Al Mehmoudiah	99	6.6%
Al Medaen	160	10.7%
Al Nehrawan	74	4.9%
Al Wehda	0	0.0%
Al Yousifiah	186	12.4%
Central Baghdad	101	6.7%
Anbar Governorate	1	0.1%
Total	**1,500**	**100.0%**

4.2 Farm Size

The average surveyed farm had 1.9 poultry houses. Poultry houses are generally simple rectangular cinder block structures with a solid concrete floor and roof supported by columns. The average area per poultry house was 1,056 square meters, and the average total housing area was 2,001 square meters.

Farm size can also refer to the maximum number of birds that a farm can house at any one time. Capacity is recorded for each registered farm. This allows a comparison between farms in the survey pool, farms that were part of the random sample, and farms that were successfully surveyed (see Table 2). Overall the size of the three groups is similar, although in the registered list there were a relatively larger percentage of farms with capacity of fewer than 10,000 birds. The median farm size of the farms surveyed in Baghdad governorate was 13,700 birds, and the average size was 20,400 birds.

Table 2: Size Comparison of Registered, Sampled, and Surveyed Farms

Farm Size	Registered	Sampled	Surveyed
Fewer than 10,000	47%	30%	34%
10,000 to 20,000	33%	30%	36%
20,001 to 30,000	11%	13%	14%
30,001 to 50,000	5%	10%	8%
More than 50,000	3%	18%	9%

4.3 Year farms built

Table 2 shows the dates of construction for sampled and surveyed farms. The oldest farm in the survey sample dates back to 1977. Twenty-four percent of the farms were built before 1980. A significant increase in the number of poultry farms occurred between 1980 and 1985, a period when many government farms were privatized and sold to individual entrepreneurs.

Table 3: Comparison Year Established for Sampled and Survey Farms

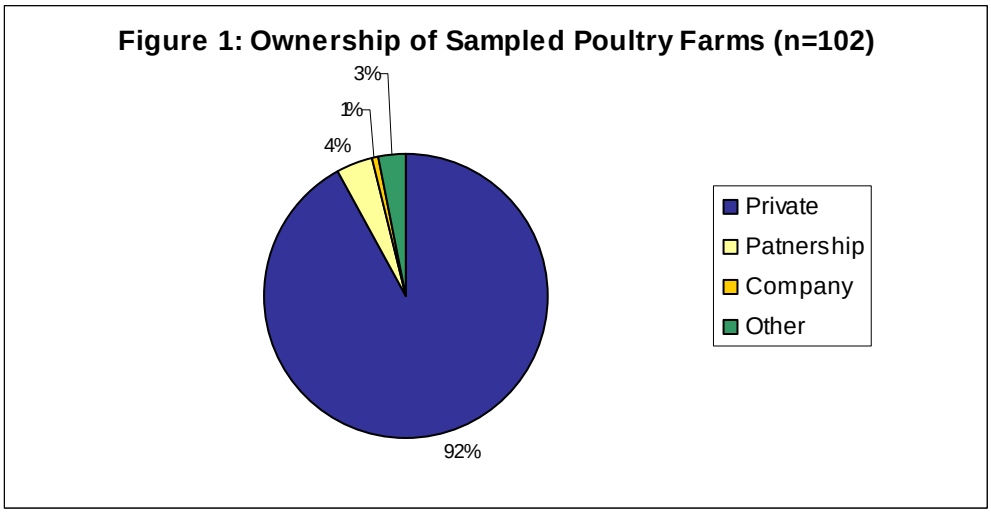
Year	Sampled		Surveyed	
≤1980	53	24%	29	29%
1981 - 1985	86	39%	34	34%
1986 - 1990	8	4%	5	5%
1991 - 1995	3	1%	1	1%
1996 - 2000	30	14%	10	10%
≥ 2001	38	17%	22	22%
Total	**218**	**100%**	**101**	**100%**

Only thee farms were built between 1991 and 1995, a period when Iraq was subject to economic sanctions imposed by the United Nations. Starting in 1996 there was a major increase in the number of farms, with 31% of the farms in the survey sample built (or rebuilt) after 1996. This latter year corresponds to the beginning of the United Nations Oil-for-Food program.

4.4 Ownership of Farms

Ownership was determined for the 102 surveyed farms (see Figure 1). All farms are private commercial enterprises and vast majority are owned by only one individual. Ninety-two percent were recorded as private, 4% as a partnership, 1% as a

company, and 3% as another type. These results fall in line with the trend of poultry farm privatization that Iraq has experienced in recent years.



4.5 Production

4.5.1 Equipment and Facilities

Although all farms are connected to the electric grid, 87% of the surveyed farms had a generator ready to provide backup power. Forty-one percent of farms are connected to a municipal water supply, 45% indicated that they used river water, 14% obtain water from a well, and 15% depend on water deliveries from tankers. Fifteen percent stated that they used multiple water sources.

Temperature must be regulated in the poultry houses, and cooling and heating equipment may be necessary to continue production at certain times of the year. Almost all of the surveyed farms had heating equipment, while half had air conditioning units.

Machinery is often used on the farm and to transport goods to and from the market. A little over half of the farms used a tractor, and 56% had a pick-up truck. Fifty-nine percent of farms had automated feeding equipment. Owners were also asked to evaluate the availability of poultry farm equipment and 29% indicated that it was "good," 53% said that it was "medium," and 18% "bad."

4.5.2 Quality and availability of day old chicks

Overall, farmers stated that the availability of chicks was not a major limitation, and most indicated that chicks were available locally. Forty-six percent of farmers stated

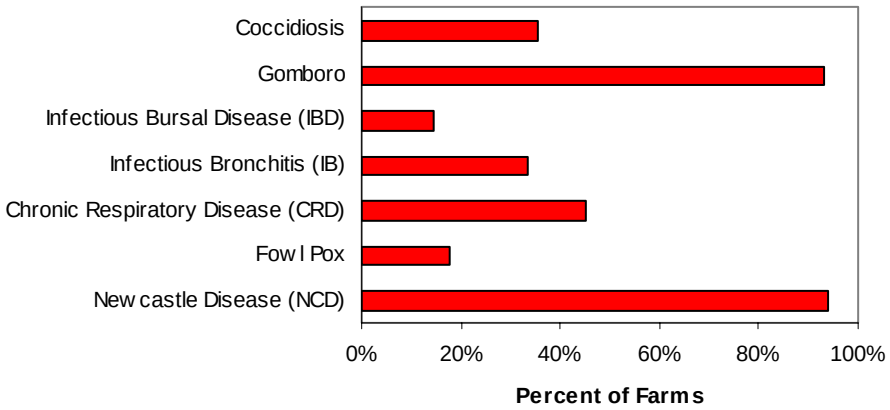
that there is “good” availability of starter chicks, 38% said there is “medium” availability, and 17% said availability is “bad.” The average cost per starter chick was 447 Iraqi dinars.

4.5.3 Vaccines and veterinary medicines

Vaccinations are a necessary component of intensive poultry production. In the past some vaccination programs were subsidized by the government. Currently, vaccinations must be privately financed, and there are no mandatory vaccination programs required by the government. Access to vaccinations and other veterinary supplies can be a problem for farmers. Only 7% stated that there is “good” availability to vaccines, over half (59%) said that there is “medium” availability, and 34% stated that there is “poor” availability.

Figure 2 shows the percentage of farmers who use vaccinations to prevent various poultry diseases that are endemic to the industry in Iraq. Newcastle disease and gomboro are the two diseases that are most commonly vaccinated against. This makes sense as these they are commonly considered two of the most dangerous in the industry. Other diseases that are commonly vaccinated against include coccidiosis, infectious bursal disease (IBD), infectious bronchitis (IB), chronic respiratory disease (CRD), and fowl pox.

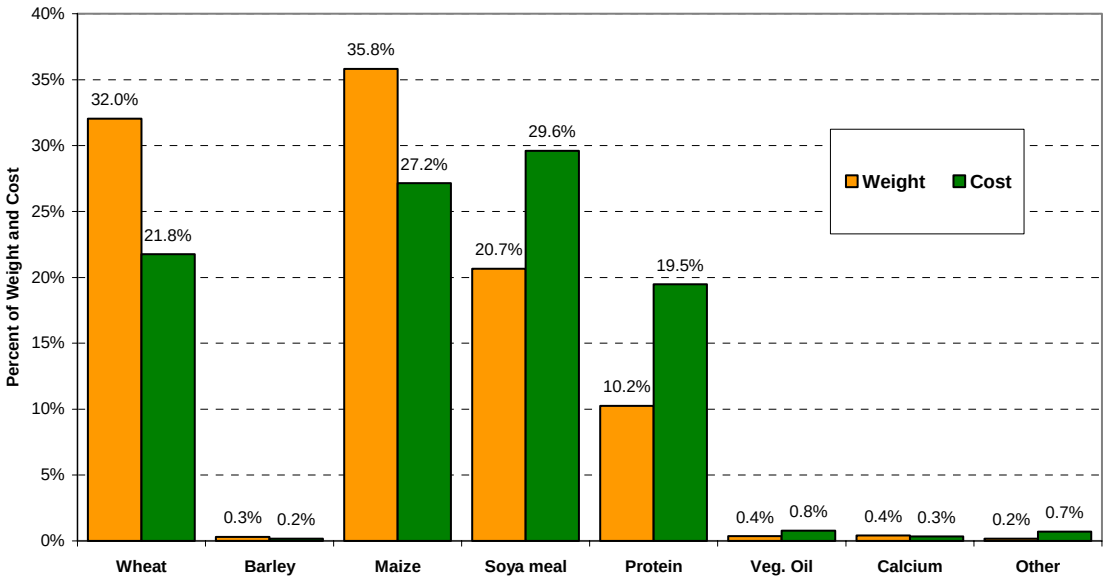
Figure 2: Use of Vaccines for Common Diseases



4.5.4 Feed

Feed is a major cost component in poultry production, and a thorough analysis is necessary to understand the challenges and opportunities of the poultry industry in Baghdad governorate. This survey examined the cost, composition, and source of feed. Figure 3 summarizes the weight and cost of the major ingredients of the average feed mix. The major ingredients by weight and cost include wheat, barley, maize, soybean meal, protein, vegetable oil, and calcium.

Figure 3: Feed Composition and Cost by Major Ingredient



Almost all of the farmers surveyed (95%) mill and mix the ingredients on the farm. There is pre-mixed feed available in Baghdad but at a higher price. Purchasing ingredients separately and incorporating them on the farm is a cost saving step used by most farms.

The two principal ingredients in poultry feed are maize (36%) and wheat (32%). Together they account for approximately two-thirds of the average mix, and provide the main source of energy (calories) in the chicken diet. Most feed maize in the market is imported from overseas through seaports, originating mainly from the United States. Domestically grown feed grade wheat is generally available and used in poultry feed. At the time of the survey, market prices of wheat and maize were similar. The price of maize was 252 dinars per kilogram, and wheat was selling for 221 dinars per kilogram.

When these results are compared to ARDI's 2004 poultry survey of northern Iraq, it is apparent that in Baghdad there is a much higher proportion of maize in poultry feed than in the governorates of Dahuk, Erbil, and Sulaymaniyah. In Baghdad the price of wheat was 3% higher, and the price of maize was 19% lower than in the north. Maize is widely available in the north, and the relatively high price in the region appears to be one of the main contributing factors to the lower utilization of maize in feed mixes in the Dahuk, Erbil, and Sulaymaniyah.

Soybean meal is one of the main sources of protein in the broiler rations, and it is imported from neighboring countries, mainly Syria and Turkey, though the original raw material reportedly comes from Argentina or Brazil. On average, soybean meal

accounts for 21% of the weight and 30% of the costs of feed. The price at the time of the survey was recorded to be 482 dinars per kilogram.

In addition to soybean meal, high protein pre-mixed supplements are also added to poultry rations. Farmers on average add two 50 pounds bags per ton of feed. These supplements are commonly referred to as simply "protein" because they contain high concentrations of animal protein derived mainly from fish meal. This animal protein supplement is imported nearly exclusively from the Netherlands. It makes up 10% of the weight of feed, and approximately 20% of the cost.

Other ingredients included in the feed ration are vitamins, veterinary supplements, trace minerals and essential amino acids. Only small amounts of these supplements are added per ton of ration, but their high cost represents nearly to 7% of the total. A few kilograms of ground calcium rock (kils) are also mixed in every ton of poultry rations. Poultry farmers also add around four kilograms of vegetable oil for every ton of poultry ration, mainly to improve the consistency of the ratio.

Except for domestic wheat, all other ingredients used in poultry feed are imported, including soybean meal, yellow maize, vegetable cooking oil, and high-protein and animal health supplements. There is potential for Iraq to lessen its current dependence on imported poultry feeds by increasing production of maize, soybeans, or sorghum.

Poultry farmers distinguish three distinct growth stages in broilers, each with its own nutritional, health, and environmental requirements. The total life cycle of a broiler usually ranges between 50 and 60 days. The first (starter) stage takes day-old-chicks through the first two or three weeks, followed by a rapid growth stage, and then a finishing stage. Poultry farmers will generally vary the composition of feed to provide the necessary nutritional and growth requirements at the different developmental stages. Table 4 shows how the average compositions of these three rations change in terms of kilograms of each ingredient per ton of ration.

Table 4: Weight and Cost of Feed Rations

	Starter Ration		**Growth Ration**		**Finishing Ration**	
	Weight (Kg)	Cost (Dinars)[1]	Weight (Kg)	Cost (Dinars)[1]	Weight (Kg)	Cost (Dinars)[1]
Wheat	297	67,007	319	71,963	346	78,143
Barley	3	719	3	529	3	627
Maize	371	93,321	359	90,372	345	86,992
Soy meal	216	104,320	206	99,470	197	94,847
Protein	103	66,244	104	66,320	100	64,114
Veg. oil	3	2,529	4	2,898	4	2,848
Calcium	4	1,182	4	1,178	4	1,024
Other	2	7,818	2	8,461	1	5,324
Total	**1,000**	**343,140**	**1,000**	**341,192**	**1,000**	**333,920**

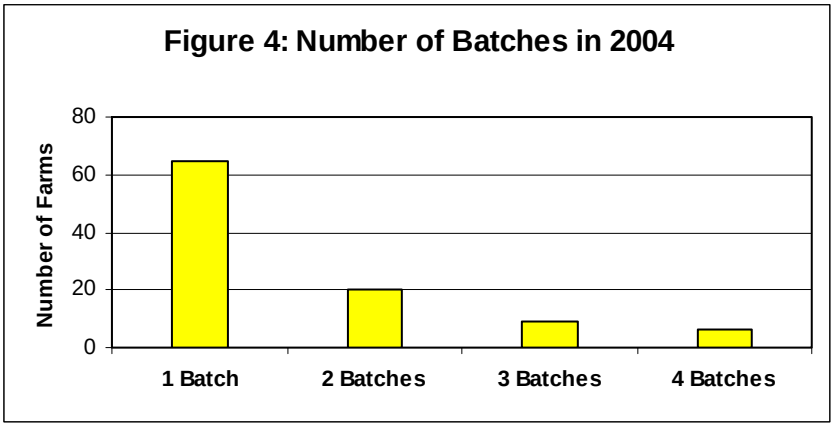
[1] Costs are based on prices obtained in the survey

There are changes in the amounts of wheat, maize, and soybean meal used in the different rations, while the quantity of other ingredients does not change much. In the earlier stages of development, more protein is added to the diet through the use of larger amounts of soybean meal in the feed mix. Higher amounts of maize are also used in the earlier stages. However, the greater utilization of maize could be attributed to fact that maize is generally perceived to be cleaner and easier to digest than wheat.

As previously mentioned, at the time of the survey the cost of wheat was 221 dinars/kg, maize was 252 dinars/kg, and soybean meal was 482 dinars/kg. The cost of the ration is reduced as less soybean meal and corn is added to the mix. The average starter ration cost 343,140 dinars/ton (343 dinars/kg), the growth ration cost 341,192 dinars/ton (341 dinars/ton), and the finishing ration's costs totaled 333,920 dinars/ton (334 dinars/kg)

4.6 Capacity Utilization

There is a significant difference between the capacity and the actual production reported by the surveyed farms. On average, surveyed farms operated at only 22% of capacity in 2004. One of the main reasons for the low capacity utilization is that farms rarely process the upper limit of five batches of chickens per year. Less than 6% of poultry farms work at near full capacity of four to five batches per year. The rest of the farms operated below capacity at three batches or fewer during 2004. Almost two-thirds of farms sold only one batch during the survey year (see Figure 4).



Actual production is the reported number of birds sold in year 2004. Production capacity is based on the assumption that a producer can produce five flocks (batches) of birds during one year in the same coop. This allows about 73 days per batch, and most batches are sold at 50 to 55 days of age, which leaves 21 days (three weeks) for cleaning and disinfecting the facility and getting it ready for a new batch of day-old chicks. The assumption of five batches per year is a conservative one, allowing for a long growing period and plenty of idle time between batches.

The average annual capacity among survey sample farms was estimated at 101,000 birds per year (the median was 69,000), on the assumption that five batches or flocks can be produced in one year in each chicken coop (see Table 5). The largest farm had capacity to produce 600,000 birds per year. The survey successfully recorded information from 6.7% of the 1,500 registered poultry farms in Baghdad governorate. Assuming that all 1,500 farms are operational, the potential production in Baghdad would total 33.6 million birds per year. As previously discussed, the actual number of operational farms in Baghdad appears to be much less than 1,500. It was discovered during the survey that around half of the registered farms were not operational. Assuming 750 operational farms, Baghdad could potentially produce 16.8 million birds per year.

Table 5: Actual Production and Production Capacity

	Average (Surveyed)	Total (Surveyed)	Baghdad Estimate A [1]	Baghdad Estimate B [2]
Housing Area (m^2)	1,867	182,974	2,744,616	1,372,308
Birds Per Batch	20,364	1,995,711	29,935,665	14,967,833
Birds Per Square Meter	10.91	10.91	10.91	10.91
Annual Production Capacity (Birds)	100,987	10,199,695	152,995,425	76,497,713
Annual Production (Birds Sold)	22,406	2,240,579	33,608,685	16,804,343
Percent Performance	22%	22%	22%	22%
Farms	1	100	1,500	750

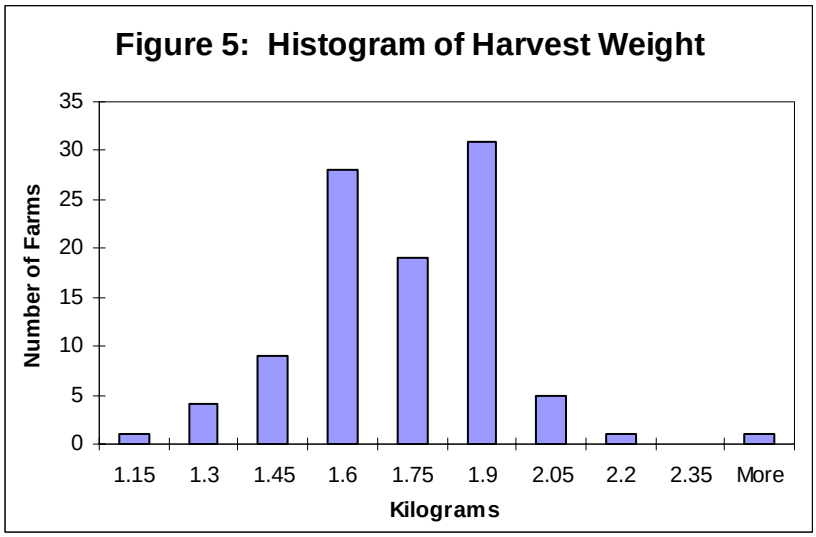
[1] Estimates assume that all of the 1,500 registered poultry farms are operational.
[2] Adjusted estimates assume that half of the registered farms are not operational.

Poultry farms are operating at less than one quarter of their installed production capacity. Total production in 2004 by sample farms was 2.2 million birds, compared with a 10.2 million bird capacity. Overall the capacity utilization ratio was estimated to be 22%. However, this does not factor in the farms that were sampled but not surveyed. Their unutilized capacity would reduce this ratio even further. The gap between actual and potential production represents ample spare capacity that could be rapidly expanded under more favorable conditions.

4.7 Growth

The survey results related to bird growth found that the average harvest weight in Baghdad was only 1.7 kilograms after 51 days. A histogram of harvest weight is shown in Figure 5. This average harvest weight in Baghdad governorate is low compared to averages in northern Iraq and in the United States. ARDI's 2004 poultry survey found that the average harvest weight in Dahuk, Erbil, and Sulaymaniyah was 2.3 kilograms, and that the average time before harvest was 54

days. In 2002, the average liveweight at slaughter in the United State was 2.3 kilograms.[2]



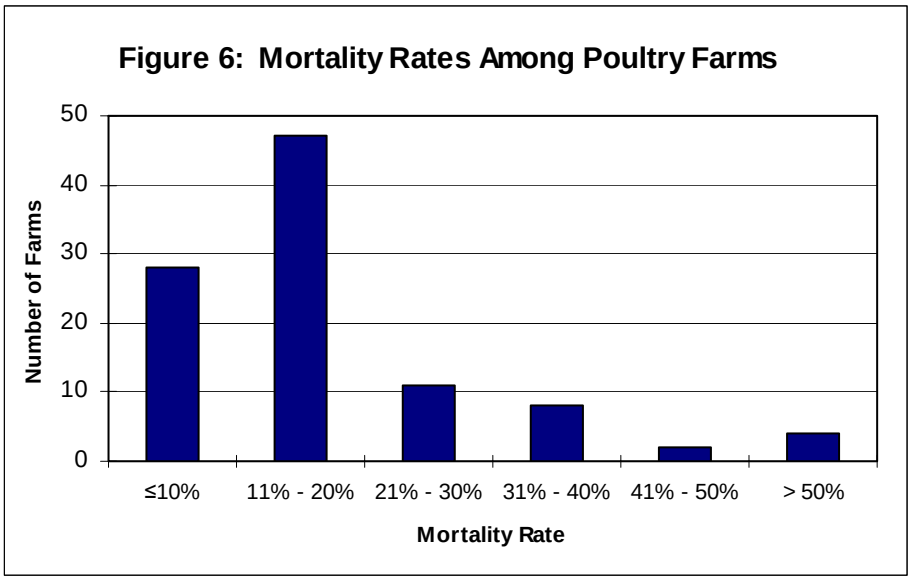
The kilograms of feed necessary to produce one kilogram of liveweight is called the feed conversion ratio. The feed conversion ratio in Baghdad governorate is estimated to be 2.96. This is very high relative to the average feed conversion ratio of 2.3 in Dahuk, Erbil, and Sulaymaniyah. In the United States the average feed conversion ratio is 2.0 or lower for most modern operations.

The economic implications of a high feed conversion ratio and low harvest weights are discussed in section five. Further discussion of these results compared to those from ARDI's poultry survey of Dahuk, Erbil, and Sulaymaniyah can be found in section six.

4.8 Mortality

High mortality rates result in low capacity utilization and high feed conversion ratios. As a result, poultry farms can ultimately suffer substantial financial losses. Farmers were asked questions related to the survival of their last batch. A histogram of the results is shown in Figure 6. More than one quarter of farms had mortality rates below 10%. Half of the farms had mortality below the median rate of 16.7%, and the other half exceeded that rate. The average mortality rate was 19.3%.

[2] Source: 2002 Poultry Yearbook, Economic Research Service, USDA



Farm operators cite many reasons for the high mortality rates. Most owners attribute high mortality rates to the poor quality of vaccines and medications against the main poultry diseases. Others attribute it to the lack of availability of proper equipment such as automatic feeder systems and climate control equipment. A large number of producers complain of the low grade quality of chicks available in the market. These chicks may be hatched under poor sanitary conditions and therefore introduce pathogens to the farm. There is also negligence among producers and managers to maintain strict isolation and sanitary conditions in the farm, and veterinary service and technicians do not track and follow-up with the poultry farms. Most farm managers are not able to tell precisely the cause of death of birds because there is a lack of diagnostic laboratories or tools.

4.9 Production Costs

An analysis of production costs is an important part of this survey because it brings together the technical and business elements of poultry production. Costs are generally categorized into:

1) **Fixed costs** that include land, housing, equipment, infrastructure, and capital;

2) **Variable costs** that include all direct expenditures needed to produce a batch of chickens including such inputs as day-old chicks, feed ingredients, wages for laborers, vaccines, and veterinary medicines.

4.9.1 Fixed Costs

This survey did not inquire about the fixed costs of the poultry farm operations for several reasons. First, many of the farm owners were not present during the data

collection visit. Response to the questionnaires was mainly obtained from farm managers, who generally have little knowledge about the costs of the installations or the magnitude of capital invested in buildings and facilities, rent, taxes, costs of buildings and equipment, cost of drilling the well, and other overhead costs. Many of the buildings and equipment were acquired many years ago, often before the managers began work at the farm. Most producers keep minimal records on their operations which makes the estimation of fixed cost items difficult. Some poultry farms are operated by renters of the housing facilities, and they often have no knowledge of the original cost and age of the facilities. Poultry farms may have been sold and bought several times and the transactions prices are not disclosed. Finally, fixed costs are notoriously difficult to allocate per unit of output. Broiler farms producing two batches per year would have double fixed cost per bird than an identical farm producing four.

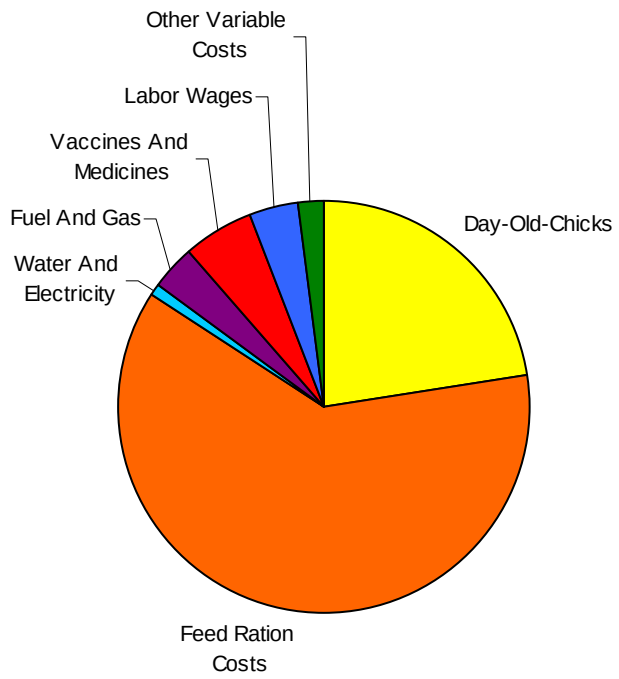
4.9.2 Variable Costs

The average variable costs from the surveyed farms are shown in Table 5 and Figure 7. Feed costs are by far the largest variable cost incurred by poultry farmers. The feed costs total 1,607 dinars per bird sold, which is 62% of the total variable costs. The next greatest expense is related to day old chicks. The average farm in Baghdad governorate spends 587 dinars or 22% of its total variable costs on day-old chicks. Together, feed and day-old chicks account for 84% of the total variable costs. The remaining variable costs include water, electricity, fuel, vaccines, labor, and other miscellaneous expenses. They account for 17% of the total variable costs.

Table 5: Variable Costs Per Bird Sold

	Average (Dinars)	**Percent**
Day-Old Chicks	587	22%
Feed Ration Costs	1607	62%
Water And Electricity	23	1%
Fuel And Gas	94	4%
Vaccines And Medicines	151	6%
Labor Wages	98	4%
Other Variable Costs	52	2%
Total Variable Costs	**2611**	**100%**

Figure 7: Variable Costs Per Bird Sold



5 Economic Evaluation

An assessment of the profitability of the poultry production sector and the overall health of the industry can be made by examining the margin between the revenue per kilogram of live bird sold and variable costs. Table 5 summarizes the average revenue and costs of the survey poultry farms.

Table 5: Revenue and Cost Summary

Age At Sale (Days)	51
Feed Conversion Ratio	2.96
Average Income (Dinars/Bird)	2623
Average Sale Weight Per Bird (Kilograms)	1.7
Average Income (Dinars/Kilogram Sold)	1549
Average Variable Cost (Dinars/Kilogram Sold)	1593
Margin Over Variable Costs (Dinars/Kilogram Sold)	-44

The average price received for chickens in Baghdad governorate was 1,549 dinars per kilogram live weight. This price is comparable to prices in northern Iraq around

the same time. ARDI's 2004 poultry survey recorded average prices of 1,469 dinars/kg in Dahuk, 1,544 dinars/kg in Erbil, and 1659 dinars/kg in Sulaymaniyah. These are competitive market prices determined by supply and demand factors, but also influenced by the influx of imported frozen chickens and chicken parts from South America, Europe and the United States.

The average variable cost per kilogram of live weight is 1,593 dinars (equivalent to 2,708 dinars for a 1.7 kg bird). As discussed in the previous section, these variable costs include feed, day-old chicks, water, electricity, fuel, vaccines, labor, and other miscellaneous expenses.

The results from the survey reveal that, on average, farms are losing money on poultry production. The average margin or difference between variable costs and the sale price was -44 dinars per kilogram live weight. This value only takes into account variable costs, and losses are greater if fixed costs are incorporated.

There is, however, wide variation among individual farms regarding the level of variable costs, and some farmers do appear to be turning a profit. Regressions were preformed on the key variables of mortality, harvest weight, and feed conversion ratio in order to better understand the variation in the margins. A summary of these results can be seen in Table 6.

Table 6: Regressions of Margins and Select Variables

	Margins vs. Mortality	**Margin vs. Weight**	**Margin vs. Feed Conversion Ratio**
Observations	78	78	78
R-squared	0.64	0.43	0.85
Intercept	933	-4567	1984
Coefficient	-54.1	2692.0	-687.1
Standard Error	4.63	355.26	33.24
t-value	-4.68	7.58	-20.67

A strong relationship exists between margins over variable costs and the percent mortality of flocks. Over 60% of the variation of the margins can be explained by the variation in mortality. The coefficient associated with mortality is -54.1 and is statistically significant. This negative relation with marginal revenue over variable cost implies that for every one-percent that mortality increases, margins are reduced by 54 dinars per kg of live bird sold.

The expected positive relationship was found between margins and sale weight. This relationship is important due to the apparent low final weight in Baghdad governorate as compared to other regions in the country. The regression revealed that for every increase of 100 grams in average sale weight, margins over variable

costs would increase approximately 269 dinars for every kilogram of bird sold. This result implies that a small increase in the average final weight could result a large number of poultry operations turning a profit.

A regression was also completed in order to better understand the relationship between margins and the feed conversion ratio. The feed conversion ratio is thus a very effective indicator of the profitability of a broiler production operation. It is relatively easy to calculate and it captures both the effect of mortality, disease, growth patterns, genetics, and nutrition. This regression had the largest R-squared value of those analyzed. Eighty-five percent of the variation in the margins over variable costs could be explained by the variation in the feed conversion ratio. A reduction of 0.1 in the feed conversion ratio would result in an increase of 69 dinars in the margin per kilogram of liveweight at sale.

6 Comparisons to the 2004 Poultry Survey of Dahuk, Erbil, and Sulaymaniyah

Completed four months earlier during the same year, ARDI's poultry survey in Dahuk, Erbil, and Sulaymaniyah provides data that can be compared with the results from the Baghdad survey. Similar results were recorded for many components of the poultry sector. However, notable differences were observed in feed composition, harvest weight, and feed conversion ratio. A comparison of selected results from the surveys is presented in Table 7.

Table 7: Baghdad Survey and Northern Iraq Survey Results

	Baghdad	Erbil, Dahuk, and Sulaymaniyah
Number Of Farms Surveyed[1]	102	145
Cost of Feed Per Kilogram	339	404
Percent of Maize in Feed	36%	2%
Percent of Wheat in Feed	32%	61%
Percent of Vegetable Oil in Feed	0.4%	3.8%
Percent Nutritional and Vet. Supplements (Other)	0.2%	0.8%
Mortality	19%	21%
Harvest Weight (Kilograms)	1.7	2.3
Feed Conversion Ratio[2]	2.96	2.29
Age At Sale (Days)	51	54
Average Income (Dinars/Kilogram)	1549	1554
Average Variable Cost (Dinars/Kilogram Sold)	1593	1277
Margin Over Variable Costs (Dinars/Kilogram Sold)	-44	277

[1] Number of usable observations may vary.
[2] Only the feed conversion ratio for Sulaimaniyah is shown here.

The cost of feed in northern Iraq was 19% more expensive than in Baghdad. Some of the difference could be attributed to higher utilization of vegetable oil and nutritional and veterinary supplements. The weight of feed was on average 3.8% vegetable oil in the north compared to only 0.4% in Baghdad governorate. Four times as many nutritional and veterinary supplements were used in the north than in Baghdad. These supplements made up 6.6% of the cost of feed in the north while only 0.7% in Baghdad. As previously noted in section 4.5.4, maize is almost completely absent in poultry feed in the north, while it makes up 36% of the total feed weight in Baghdad.

Although mortality rates were relatively similar, final sale weight was 26% less in the Baghdad than in the north. This result is reflected in the feed conversion ratio, among other components of production. The feed conversion ratio in Baghdad was 2.96 compared to around 2.3 for the north.

The margin over variable costs shows a major difference between the profitability of farms in the north and in the south. On average, farms in the north have positive margins and farms in Baghdad are losing money. In Baghdad governorate the average margin over variable costs was -44 dinars per kilogram sold, in Erbil, Dahuk, and Sulaymaniyah it was a positive 277 dinars per kilogram sold.

8 Conclusion and Recommendations

A healthy poultry sector is vital for the health of Iraqi citizens and the Iraqi economy. However, based on survey results, the health of Baghdad's poultry sector is in doubt. Two related questions have developed out of the analysis of the results:

1) Why are poultry farms not producing heavier birds?
2) How can poultry farms become more profitable?

There could be a number of reasons for the low harvest weight in Baghdad governorate. Possible explanations include poor nutrition, environmental stress, disease, and inferior flock genetics. However, survey results point more towards nutrition and genetics as the main contributing factors. The fact the mortality rates in the north and Baghdad are similar may rule out environmental stress and disease as causes for low harvest weight. If flocks in Baghdad were under these pressures, mortality rates would be higher than in the north.

Feed mix is significantly different in Baghdad compared to what is used in the north. The largest difference by weight is the amount of wheat and maize used in the different regions. Maize is almost completely absent in feed in the north, while over one-third of the mix in Baghdad consists of maize. This may not sufficiently explain the difference in harvest weights, because maize and wheat are relatively similar in nutritional content.

However, the use of greater amounts of vegetable oil in the north might provide an explanation for the difference in harvest weights. Over nine times more vegetable oil is used in poultry feed the north. The greater amounts of vegetable oil translate to overall greater caloric content of feed mixes. Poultry farmers in the north also add over four times more nutritional and veterinary supplements to feed. These supplements are very costly, and are a significant investment in the health and growth of their flocks. Improved nutrition and increased caloric intake may contribute to larger harvest weights in the north, and needs to be investigated further.

The genetic makeup of flocks in the north and Baghdad is still uncertain, and also needs to be investigated further as it can also play a significant role in growth patterns. Both surveys asked farmers which breed(s) they use, but answers were many times unclear. Farmers often confused breed with origin, and it is not clear if there is a significant difference in genetic makeup between the farms in the north of Iraq and in Baghdad.

A number of areas of poultry production can be improved in order for farms in Baghdad to become more profitable. The regressions presented in section six reveal some opportunities. As discussed, for every increase of 100 grams in average sale weight, margins over variable costs would increase approximately 269 dinars for every kilogram of bird sold. Clearly with only a very small increase in sale weight, many farms will be move from negative to positive margins over variable costs. Reducing mortality is another area that could be improved. If mortality is reduced by one-percent, margins increase by 54 dinars per kilogram of live bird sold.

7.1 Recommendations

Because poultry meat has become an essential ingredient of the Iraqi diet and a major component of the agricultural sector, it is important to find ways to encourage the growth of this sector to meet the needs of a growing population with higher incomes.

This survey of poultry farms provides basic information about the production process and challenges and opportunities faced by producers. Based on these observations we suggest the following steps to help poultry farmers overcome those problems and raise the productivity of the sector.

- Study the nutritional content of feed mixes and the nutritional requirements of poultry Baghdad governorate. Poorly balanced rations and poor quality of ingredients result in slower growth, higher mortality, and lower conversion ratios.

- Encourage the development of poultry feed companies to provide high quality feed for broilers.

- Determine the genetic makeup of poultry in Baghdad governorate, and promote the introduction of breeds with higher production potential. Promote more thorough testing of chicks being sold to farmers to guarantee their health status.

- Encourage greater use of vaccinations to protect against common poultry diseases to reduce mortality and production risks. Regular visits and supervision by veterinary inspectors are needed, especially in farms that depend on staff with little experience in modern poultry production.

- Provide a more reliable supply of electricity to farms in order to maintain better climate control in the coops. Encourage producers also to maintain their equipment in better condition or purchase new equipment for environment controls.

- Study the reasons why production costs in some farms are significantly higher than the average. In those cases where costs are higher, identify specific measures to assist farmers in reducing costs or raising productivity.

Annex:

Tariffs and Competitiveness of the Poultry Sector

The precarious competitive situation of the poultry sector in Iraq can be attributed to many factors: breakdowns in public security and the provision of basic utilities like electricity, water, and fuel; difficult access to affordable and good quality inputs; lack of credit for operating and investment capital; deficiencies in management and technology resulting from decades of insulation from the rest of the world; and strong competition from imported frozen chickens and chicken parts from countries with more advanced poultry industries. Some of these imports are supported by subsidies in producing countries.

There are many ways to help poultry producers in Iraq become more efficient and competitive by addressing the above contributory factors. A frequently encountered suggestion is to impose a tariff on imported frozen chicken meat or to subsidize domestic poultry production as a way to protect the sector from foreign competition. This annex to the *Baghdad Poultry Farm Survey: Summary Report* looks at the possible merits of these alternatives.

There are several justifications for a temporary subsidy or tariff to promote the poultry sector in Iraq. For the previous ten years, while Iraq was subject to the United Nations trade embargo, poultry meat became the main source of animal protein for the population. Poultry production was in private hands but depended entirely on state distribution of inputs, was highly regulated, and had a captive local market. Following the 2003 war, the state-run input distribution channels collapsed and the sector was suddenly exposed to competition from imported chicken.

A tariff on imported poultry or a subsidy to poultry producers can then be justified on several grounds:

- As temporary assistance in the transition of the industry following the collapse of the state input distribution system;
- As protection against the sudden massive inflow of foreign imported chicken meat;
- As protection against subsidies received by grain and poultry producers in those countries exporting chicken meat to Iraq;
- As a way to promote value addition and employment generation in agriculture during a critical economic situation period;
- As a way to enable poultry farmers to make the necessary investments to raise their productivity.

A tariff essentially raises the domestic price above the world market price by the amount of the tariff, and the new price applies to both locally produced and imported chicken. Of course the price of domestic live chickens will differ from the price of imported frozen chickens, but the tariff will be proportional. Consumers then pay the higher price on all their chicken consumption, not just on the imported product. Consumers also consume less chicken as a result of higher market prices. Producers, on the other hand, benefit from the higher price on their current production, but also on the additional production encouraged by the higher price. Tariffs also generate additional funds to the public treasury.

Unlike a tariff, a subsidy does not result in a price increase, and consumption remains the same. Consumers are not directly impacted by subsidized production; although all Iraqi citizens support the poultry industry though tax revenue. Similar to a tariff, producers benefit through increased production.

The following economic analyses are used to illustrate the main outcomes that emerge from the imposition of a temporary tariff on chicken meat imports or a temporary subsidy of domestic production. In the absence of actual data regarding the magnitude of the market we use reasonable assumptions related to supply and demand. Alternative values can be explored to test the sensitivity of conclusions.

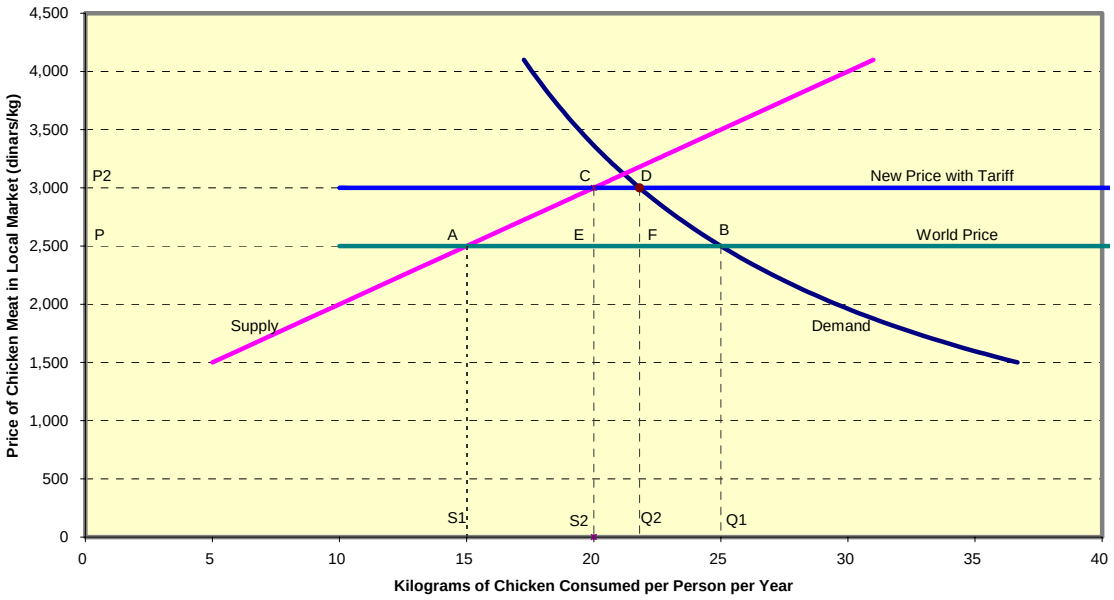
We assume demand for chicken in which an average person in Iraq consumes one kilogram of chicken meat per week or about 25 kg per year, when the average price is 2,500 dinars per kilogram. We further assume that a 10 percent rise in prices result in a reduction of 7.5 percent in consumption (see Table 1-A and Figure 1-A).

Table 1-A: Tariff and Subsidy Model Assumptions and Results

Market Demand	
25	Kg per Person per Year – Consumption
2,500	Price per kg of Chicken Meat (dinars per kg)
-0.75	Elasticity of Consumption
8,839	Constant in Demand Function
Local Supply	
15	Local Production of Chicken Meat
1000	Intercept of Supply Function
100	Slope (b) of Supply Function
1.67	Supply Elasticity
Current Market Conditions	
2,500	World Price of Imported Chicken
25	Consumption (kg per person)
15	Production (kg per person)
10	Imports (kg per person)
Market Conditions with a Tariff	
500	Tariff on Chicken Imports (dinars per kg)
3,000	New Market Price (dinars per kg)
21.8	New Consumption (kg per person)
20	New Production (kg per person)
1.8	New Imports (kg per person)
-11,701	Change in consumer surplus(dinars per person)
8,750	Change in Producer Surplus (dinars per person)
902	Customs Revenue (dinars per person)
-2,049	Net Change in Economy from Tariff (dinars per person)
Market Conditions with a Subsidy	
500	Amount of Subsidy (dinars per kg)
20	New Production (kg per person)
2,500	New Market Price (dinars per kg)
25	Consumption (kg per person)
5	New Imports (kg per person)
-10,000	Cost of Subsidy to Government (dinars per person)
8,750	Change in Producer Surplus (dinars per person)
-1,250	Net Change in Economy from Subsidy (dinars per person)
25	Iraq Population (millions)

Comparison of the Impacts to the Economy		
Tariff	**Subsidy**	
-195	0	Loss by Consumers (million dollars)
146	146	Gain by Producers (million dollars)
15	-167	Government Revenue (million dollars)
-34	-21	Net Gain/Loss to Economy from Tariff (million dollars)

Figure 1-A Effect of Tariff on the Chicken Meat Market



We also assume that 40 percent of consumption is imported frozen chicken and the other 60 percent is locally produced. A linear supply is postulated in which an increase of 10 percent in price induces an increase in poultry production of 16.7 percent.

The current price of chicken in the market roughly reflects the equivalent world market price because Iraq at present does not have a tariff on chicken meat. The world price of chicken meat in Baghdad is therefore about 2,500 dinars/kg. At this price annual per capita consumption is 25 kg, production 15 kg, and imports 10 kg.

A tariff of 500 dinars per kilogram, or 20 percent of the world price, will result in a new local market price of 3,000 dinars per kilogram. At the new price, consumption per person is reduced to 21.8 kg per year, but domestic poultry production increases to 20 kg per year, and imports of 1.8 kg fill the deficit in consumption. In Figure 1-A the new market situation is depicted by the points C and D marking the intersection of the supply and demand curves with the new price with tariff.

Consumers suffer a welfare loss with the imposition of a tariff on imported chicken meat. Before the tariff a typical consumer spent 62,500 dinars per year for 25 kg of chicken. After the tariff the same consumer spends 65,400 dinars for 21.8 kg of chicken. The magnitude of this loss in consumer welfare is represented graphically by the area delimited in the diagram by the points P1-P2-D-B. Under the postulated demand and supply conditions, this area represents a consumer loss of 11,701 dinars per person per year.

Producers' gain from the tariff can be estimated as the area in the diagram delimited by the points P1-P2-C-A. Note that the area below the supply line between points A and C is not a gain to poultry producers because it represents actual costs incurred in producing the additional supply of chickens. The gain in producer surplus from the tariff is estimated at 8,750 dinars per Iraqi consumer.

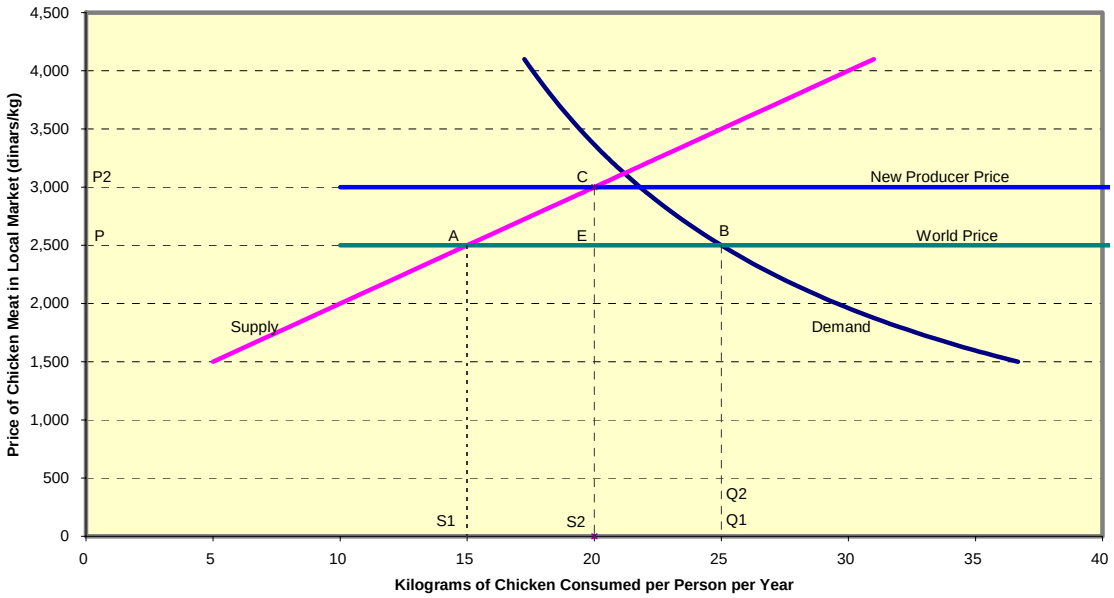
Chicken meat imports decline by 85 percent as a result of the tariff, from 10 kg per person to only 1.8 kg. This reduction is partly due to the substitution by domestic chicken, but also due to the reduction in chicken consumption per person. Customs officials collect the tariff on the remaining imports and generate total revenue equivalent to 902 dinars per person per year.

Multiplying the above results by Iraq's population allows us to extrapolate the welfare impacts of a tariff to the national level. Imposing a tariff of 20 percent on chicken meat would result in a loss of consumer welfare equivalent to $195 million dollars. On the other hand, poultry producers would benefit from the tariff by an estimated $146 million dollars, and the government would collect import duties of $15 million dollars from imported chicken meat. The economy as a whole, however, would suffer a loss in national welfare equivalent to $34 million dollars. The imposition of a tariff on imported chicken meat thus results in a transfer of income and welfare from consumers to producers and government, with a net loss of welfare to the general economy.

The effects of a subsidy can be seen in Table 1-A and Figure 2-A. A government subsidy of 500 dinars per kilogram would also increase domestic production from 15 to 20 kg per person (moving from point A to C in the supply line). However, with subsidized production the price of chicken would remain at 2,500 dinars. Consumption of imported poultry would be reduced by 50 percent to 5 kg per person. The annual cost of the subsidy to the government will be 10,000 dinars per person, of which producers benefit 8,750 dinars per person, and the remaining 1,250 dinars per person is a net loss to the economy from redirecting resources from other uses.

Extrapolating to the larger economy, the increase in production as a result of the subsidy benefits poultry farms by $146 million dollars (shown in the Figure 2-A by the area P1-P2-C-A). The costs to the government to fund the subsidy total $167 million dollars (rectangle P1-P2-C-E). The net loss to the economy is represented by the triangle AEC, and totals $21 million dollars. This can be compared to the net loss of $34 million dollars as a result of a tariff. Relative to the size of the economy, the nets losses from either a tariff or a subsidy are negligible.

Figure 2-A: Effect of Subsidy on the Chicken Meat Market



The preceding economic analyses present the different responses to a tariff and a subsidy. A direct payment of 500 dinars per kilogram has the same effect on producers as a 500 dinars tariff on imported chickens. But consumers are not directly affected by the subsidy since the prevailing market price remains at the world market level and consumption does not change. A direct subsidy is therefore a simple transfer of income from taxpayers to poultry producers, while a tariff essentially taxes poultry consumption. It is clear that there are benefits and costs to consider with each policy.

We can expect that as a result of tariffs or subsidies, the supply response to an increase in the output price in poultry production to be very positive. There is ample spare capacity in place, so production could be expanded rapidly. Most inputs used in poultry production are imported; a rapid increase in production will not cause a shortage of most input supplies because those supplies are mainly coming from overseas. We can therefore expect that a 10 percent increase in the price received by farmers will induce a more than proportional output increase (supply elasticity above 1.0). High supply elasticity means that a small subsidy or tariff can induce a significant increase in supply, and a rapid displacement of imports.

There are social grounds for promoting poultry production as well. Poultry is produced by many small private sector operators scattered throughout the national territory, thus generating employment for low skill labor in rural areas which are among the poorer segments of the population. The income multiplier effect in rural areas from agricultural enterprises has been estimated in other countries at two or three times the actual value added. A small tariff or subsidy can thus induce significant growth in the national economy, especially in rural areas.

Politically, a tariff may be easier to establish because it is an administrative decision by the Ministry of Trade; a subsidy normally requires parliamentary approval as part of the overall government budget process and periodic review. At the moment, Iraq can choose either a tariff or a subsidy depending on the above considerations; however, once Iraq signs on to the World Trade Organization (WTO) its flexibility to impose tariffs and subsidies will be severely curtailed.

Both the creation of a temporary tariff on imported poultry, and a temporary subsidy on production would support an important industry that is struggling in the new Iraqi economy. The survey results and discussion from the preceding report details the components of poultry production that can be improved and the potential impact on poultry farm revenue. Net returns increase significantly with small improvements in the feed conversion rate. There is much room for improvement as the industry lags behind international competition. The temporary protection of Iraq's poultry industry would provide an opportunity for the industry to modernize and become more competitive in domestic and international markets. An efficient and profitable domestic poultry industry benefits producers, consumers, and the Iraqi economy.